## **CLAIMS TO INVENTION**

1. A broad-band polarizer comprising:

a film of at least one material having a cholesteric order and sites of non-linearly varying pitch across the thickness of said film and

at least one liquid crystal material similarly non-linearly distributed across the thickness of said film and disposed at said sites.

- 2. A broad band polarizer according to claim 1 wherein said non-linearly varying pitch is an exponentially varying pitch.
- 3. A broad-band polarizer according to claim 1 wherein said material having a cholesteric order is a polymer.
- 4 A broad-band polarizer according to claim 1 wherein said material having a cholesteric order is a monomer.
- 5. A broad-band polarizer according to claim 1 wherein said material having a cholesteric order is anoligomer.
- 6. A broad-band polarizer according to claim 1 wherein said at least one said liquid crystal material is a nematic liquid crystal.
- 7. A broad-band polarizer according to claim 1 wherein said at least one liquid crystal material is a smectic liquid crystal.
- 8. A broad-band polarizer according to claim 1 wherein said at least one material having a cholesteric order is photopolymerizable.
- 9. A broad-band polarizer according to claim 1 wherein said

at least one liquid crystal material is photopolymerizable.

- 10. A broad-band polarizer according to claim 1 wherein at least one of said at least one material having a cholesteric order and said at least one liquid crystal material which is polymerizable.
- 11. A broad-band polarizer according to claim 1 wherein the segregation rate of said at least one liquid crystal material is greater than the polymerization rate of whichever of said materials is polymerized.
- 12. A broad-band polarizer according to claim 1 wherein the segregation rate of said at least one liquid crystal material, is greater than the polymerization rate of said at least one material having a cholesteric order.
- 13. A broad-band polarizer according to claim 1 wherein the segregation rate of said at least one liquid crystal material is greater than the polymerization rate of said material having a cholesteric order.
- 14. A broad-band polarizer according to claim 1 wherein said at least one material having a cholesteric order is a cholesteric liquid crystal.
- 15. A broad-band polarizer according to claim 1 wherein said at least one material having a cholesteric order is a cyclic liquid crystal siloxane.
- 16. A broad-band polarizer according to claim 1 wherein said at least one material having a cholesteric order is a material

which is polymerized by cationic polymerization.

- 17. A broad-band polarizer according to claim 1 wherein said at least one liquid crystal material is a material which is polymerized by cationic polymerization.
- 18. A broad-band polarizer according to claim 1 wherein said at least one liquid crystal material is a low molecular weight material.
- 19. A broad-band polarizer according to claim 1 wherein said film has a thickness sufficient to totally reflect incident circularly polarized electromagnetic radiation.
- 20. A broad-band polarizer according to claim 1 wherein said film reflects incident circularly polarized electromagnetic radiation in the visible spectrum.
- 21. A broad-band polarizer according to claim 1 wherein said film reflects incident circularly polarized electromagnetic radiation in the infrared portion of the electromagnetic spectrum.
- 22. A broad-band polarizer according to claim 1 wherein said film reflects incident circularly polarized electromagnetic radiation in the ultraviolet portion of the electromagnetic spectrum.
- 23. A broad-band polarizer according to claim 1 wherein at least one of said at least one material having a cholesteric order and said at least one liquid crystal material is in the liquid state.

- 24. A broad-band polarizer according to claim 1 wherein at least one of said at least one material having a cholesteric order and said at least one liquid crystal material is in the solid state.
- 25. A method of fabricating abroad-band polarizer comprising the step of:

forming a film from at least one material having a cholesteric order and at least a given pitch and at least one liquid crystal material such that said at least one liquid crystal material is distributed non-linearly across the thickness of said film in a plurality of similarly non-linearly distributed sites having pitches greater than said at least given pitch in said at least one material having a cholesteric order.

- 26. A method according to claim 25 wherein said at least one material having a cholesteric order is a polymer.
- 27. A method according to claim 25 wherein said at least one material having a cholesteric order is a monomer.
- 28. A method according to claim 25 wherein said at least one material having a cholesteric order is an oligomer.
- 29. A method according to claim 25 wherein said at least one material having a cholesteric order is a low molecular weight material.
- 30. A method according to claim 25 wherein said at least one liquid crystal material is a nematic liquid crystal.
- 31. A method according to claim 25 wherein said at least one

liquid crystal material is a smectic liquid crystal.

- 32. A method according to claim 25 wherein said at least one material having a cholesteric order is photopolymerizable.
- 33. A method according to claim 25 wherein said at least one liquid crystal material is photopolymerizable.
- 34. A method according to claim 25 wherein at least one of said at least one material having a cholesteric order and said at least one liquid crystal material is polymerizable.
- 35. A method according to claim 25 wherein the segregation rate of said at least one liquid crystal material is greater than the polymerization rate of whichever of said materials is polymerized.
- 36. A method according to claim 25 wherein the segregation rate of said at least one liquid crystal material is greater than the polymerization rate of said at least one material having a cholesteric order.
- 37. A method according to claim 25 wherein the segregation rate of said at least one liquid crystal material is greater than its polymerization rate.
- 38. A method according to claim 25 wherein said at least one material having a cholesteric order is a cholesteric liquid crystal.

- 39. A method according to claim 25 wherein said at least one material having a cholesteric order is a cyclic liquid crystal.
- 40. A method according to claim 25 wherein said at least one material having a cholesteric order is a material which is polymerized by cationic polymerization.
- 41. A method according to claim 25 wherein said at least one liquid crystal material is a material which is polymerized by cationic polymerization.
- 42. A method according to claim 25 wherein said at least one liquid crystal material is a low molecular weight material.
- 43. A method according to claim 25 wherein said film has a thickness sufficient to totally reflect incident circularly polarized electromagnetic radiation.
- 44. A method according to claim 25 wherein said film reflects incident circularly polarized electromagnetic radiation in the visible spectrum.
- 45. A method according to claim 25 wherein said film reflects incident circularly polarized electromagnetic radiation in the infrared portion of the electromagnetic spectrum.
- 46. A method according to claim 25 wherein said film reflects incident circularly polarized electromagnetic radiation in the ultraviolet portion of the electromagnetic spectrum.
- 47. A method according to claim 25 wherein at least one of

said at least one material having a cholesteric order and said at least one liquid crystal material is in the liquid state.

- 48. A method according to claim 25 wherein at least one of said at least one material having a cholesteric order and said at least one liquid crystal material is in the solid state.
- 49. A method according to claim 25 wherein the step of forming includes the step of:

mixing said at least one material having a cholesteric order and said at least one liquid crystal material in a given ratio by weight to form a mixture.

- 50. A method according to claim 44 wherein said given ratio by weight is 2:1.
- 51. A method according to claim 48 wherein said given ratio by weight of said at least one material having a cholesteric order and said at least one liquid crystal material is in a range of 1:3 to 6:1.
- 52. A method according to claim 48 further including the step of adding a photoinitiator into said mixture.
- 53. A method according to claim 48 further including the step of adding a chiral additive to said mixture.
- 54. A method according to claim 51 further including the step of heating said mixture at a temperature sufficient to maintain said mixture in a liquid state.
- 55. A method according to claim 53 further including the step

of irradiating said mixture with electromagnetic radiation to polymerize at least one of said at least one material having a cholesteric order and said at least one liquid crystal material.

- 56. A method according to claim 54 wherein the step of irradiating said mixture includes the step of applying actinic radiation to said mixture.
- 57. A method of forming a single layer polarizer comprising the steps of:

forming a film from a first liquid crystal material and a second liquid crystal material, one of said materials having a non-linear distribution in said film across the thickness of said film at similarly non-linearly distributed sites disposed in the other of said materials.

58. A method of forming a single layer polarizer comprising the steps of:

forming a film from a first liquid crystal material and a second liquid crystal material, one of said materials having a non-linear distribution in said film across the thickness of said film at similarly non-linearly distributed sites disposed in the other of said materials.

- 59. The broad-band polarizer according to claim 1 wherein said material having a cholesteric order is a non-cross-linkable low molecular weight liquid crystal compound.
- 60. The broad-band polarizer according to claim 1 wherein said material having a cholesteric order is